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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Modeling regional aerosol variability over California and its sensitivity to emissions and long-range transport during the 2010 CalNex and CARES campaigns" *by* J. D. Fast et al.

Anonymous Referee #2

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The manuscript examines the spatial and temporal variability in aerosol concentrations, composition, and size distribution simulated with a version of the WRF-Chem model. The model predictions are evaluated in great detail with measurements from the two field experiments (CalNex and CARES) during May and June of 2010. It presents an extensive review of meteorology, trace gases and aerosol distributions in the California region using both observations and regional model. The manuscript is suitable for publishing in the ACP but could be improved by largely reducing its length and being more focused on its center objectives. Currently, it is titled as modeling regional aerosol

variability, although not until half way through the main text, there are discussions on aerosol properties. Analyses of meteorological conditions and gaseous precursors are important, however, it is more appropriate to include them for explaining the biases in aerosol simulations, than giving a full and detail evaluation upfront. The second-half discussions on aerosol extinction profile and AOD seem to be detached from the extensive comparison of surface meteorology and trace gases in the first half; because as pointed by the authors, the latter in this region/time is dominated by the uncertainty in the long-range transport (boundary conditions) of aerosols.

Several specific comments are suggested below:

1. Introduction (Page 7194, lines 24-): the first objective of this study is said to describe how the multi-platform observational data sets have been integrated into the Aerosol Model Testbed (AMT). This may be more appropriately included as part of the methodology rather than a science objective: except for 2.2, most of the discussions are about the evaluation of the WRF-Chem simulations and uncertainties. Also, will this AMT testbed case and toolkit mentioned become available at the time of publication? If so, the link to the ARM front page needs to be replaced with the correct webpage.

2. Section 3: Model description: Consider to move the discussions in the first two paragraphs about the WRF-Chem set-ups and emissions (i.e., second paragraph on page 7202) to the Appendix.

3. Section 4: please refer to the main comment above.

4. Section 5: what's the difference between AOT and AOD here? Usually they are inter-exchangeable in the modeling world. How important is the relative humidity bias in the model and aerosol water take contributing to the AOD differences in the column? What is the main aerosol type being reduced in the 50%_LBC case? If initial conditions are reduced by half too, does it mean this sensitivity study also include adjustment of local aerosol contributions?

minor comments:

1. Page 7237, line 8: should be “due to missing”
2. Figures 27 and 28: title of panel (a) is missing from the graph

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Interactive comment on Atmos. Chem. Phys. Discuss., 14, 7187, 2014.